

## **CDC Influenza Division Key Points**

January 5, 2018

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### **Summary Key Points**

- According to the most recent [FluView](#) report, seasonal influenza activity in the United States increased sharply again from the previous week's report.
- The proportion of people seeing their health care provider for influenza-like-illness (ILI) increased again; the number of states experiencing high flu intensity went from 21 to 26, and the number of states reporting widespread activity went from 36 to 46.
- These ILI activity and geographic spread indicators are similar to what was seen during the peak of the 2014-2015 season; which was the most severe season in recent years.
- Current unadjusted hospitalization rates also are similar to what was seen during the same week in 2014-15.
- This is the 6th week that ILI has been at or above the national baseline.
- By this measure, recent seasons have averaged 13 weeks, with the longest season lasting 20 weeks.
- So far, influenza A(H3N2) viruses have been most common this season.
- H3N2-predominant seasons have been associated with more severe illness especially among people older than 65 years and children.
- Vaccine effectiveness (VE) against H3N2 viruses has been around 30%, whereas effectiveness against H1N1 viruses has been about 60% and effectiveness against influenza B viruses has been around 50%.
- The relatively lower vaccine effectiveness seen against H3N2 viruses may, in part, be caused by egg-adapted changes introduced when H3N2 viruses are optimized for growth in eggs, which is required for the egg-based production used to produce most U.S. flu vaccines.
- Flu is difficult to predict. It's not possible to say precisely when the 2017-2018 flu season will peak or end, how severe it will be, or what viruses will circulate over the course of the flu season.
- An average of flu activity forecasts generated by Influenza Division's flu forecasting initiative suggests that flu activity will continue to increase in the short term and the peak of influenza may occur by the end of December (30% chance) or by the

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end of January (60% chance). For more information, please see the section [Influenza Forecasting Initiative](#).

- The [Centers for Disease Control and Prevention \(CDC\)](#) recommends [annual flu vaccination](#) for everyone 6 months and older as soon as possible.
- Now is still a good time to get vaccinated.
- As long as flu viruses are circulating, vaccination should continue throughout the flu season, even in January or later.
- There are many reasons to get a flu vaccine.
  1. While flu vaccine can vary in how well it works, it is the best way to prevent flu illness and serious flu complications, including those that can result in hospitalization.
  2. Even with vaccine effectiveness in the range of 30 to 60 percent, flu vaccination prevents millions of illnesses and tens of thousands of flu-related hospitalizations each year.
  3. A QA explaining why recent reports of 10 percent flu vaccine effectiveness in Australia may not apply to the U.S. this season has been posted on the CDC website at <https://www.cdc.gov/flu/about/season/flu-season-2017-2018.htm#effectiveness>.
  4. We cannot know which viruses will circulate over the season and which virus will predominate. Flu vaccine protects against three or four different flu viruses, depending on which vaccine you get.
  5. A [2017 study](#) was the first of its kind to show that [flu vaccination can significantly reduce a child's risk of dying from influenza](#).
  6. Getting vaccinated yourself protects people around you, including those who are more vulnerable to serious flu illness, like babies and young children, older people, and people with certain chronic health conditions.
  7. While flu vaccine is not perfect and some people who get vaccinated may still get flu, there is some data to suggest that flu vaccination may make illness milder.
- Manufacturers report having shipped more than 150.3 million doses of flu vaccine as of December 15, 2017.
- The total projected supply of vaccine in the United States this season is between 151 million and 166 million doses of flu vaccine. About 119 million doses will be quadrivalent vaccine.
- Go to <https://vaccinefinder.org> or [www.cdc.gov/flu](http://www.cdc.gov/flu) to find a location near you where you can get vaccinated.
- While flu vaccine is the best way to prevent flu, influenza antiviral drugs are a second line of defense that can be used to treat flu illness.

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- As flu activity continues to increase, providers and the public should be reminded that there are prescription medicines (pills, liquid or an inhaled powder) that can be used to treat influenza infection.
- CDC recommends that people who are very sick or people who are sick who are at high risk of serious flu complications be treated early with flu antiviral drugs.
- While manufacturers report they expect to meet projected seasonal demands, CDC has received reports of spot shortages in certain states with high influenza activity.
- As influenza antiviral drugs are mainly used seasonally, patients may want to consider calling a pharmacy in advance to see if they have antiviral drugs on their shelf. If the pharmacy does not have product, they may be able to identify another pharmacy in the area that has antiviral drugs in stock.
- For people who have flu and are at high risk of serious flu complications, treatment with an antiviral drug can mean the difference between having a milder illness and having a very serious illness that could result in a hospital stay.
- Most people who are otherwise healthy and get the flu do not need to be treated with antiviral drugs, but some people may be treated with antiviral drugs by their doctor.
- If you get the flu and need antivirals, the earlier you begin taking antivirals, the better.

## **Influenza Treatment: Antiviral Medications**

- On December 27, 2017, CDC issued a Health Advisory (<https://emergency.cdc.gov/han/han00409.asp>) through the Health Alert Network, providing notice about 1) increased influenza A(H3N2) activity and its clinical implications, 2) a summary of influenza antiviral drug treatment recommendations, 3) an update about approved treatment drugs and supply this season, and 4) background information for patients about influenza treatment.
- It's very important that antiviral drugs are used early to treat hospitalized patients, people with severe flu illness, and people who are at high risk of serious flu complications based on their age or health.
- CDC recommends that people who are very sick or people who are sick who are at high risk of serious flu complications be treated early with flu antiviral drugs.
- Antiviral drugs work best when started within two days of symptoms first appearing, but there are data to suggest they can still be beneficial in very ill patients even up to five days after getting sick. This would be especially important for a person who is at high risk of serious flu complications and who is very sick.
- Three FDA-approved influenza antiviral drugs are recommended for use in the United States during the 2017-2018 influenza season: oseltamivir (Tamiflu® and

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generic formulations), zanamivir (Relenza®), and peramivir (Rapivab®). Generic formulations of oseltamivir became available commercially last season.

- There are no current national shortages of neuraminidase inhibitors (i.e., oseltamivir, zanamivir and peramivir), and manufacturers report they expect to meet projected seasonal demands.
- CDC has received reports of spot shortages in certain states with high influenza activity.
- As influenza antiviral drugs are mainly used seasonally, patients may want to consider calling a pharmacy in advance to see if they have antiviral drugs on their shelf. If the pharmacy does not have product, they may be able to identify another pharmacy in the area that has antiviral drugs in stock.
- If you get sick with flu, antiviral drugs can be used to treat your illness.
- Antiviral drugs are prescription medicines (pills, liquid or an inhaled powder) and are not available over the counter.
- Antiviral drugs are different from antibiotics. Antiviral drugs fight viruses (like flu viruses) in your body; antibiotics fight infections in your body that are caused by bacteria.
- Antiviral drugs are not a substitute for getting a flu vaccine. The flu vaccine is the best way modern medicine currently has to protect against this potentially serious disease.
- For people who have flu and are at high risk of serious flu complications, treatment with an antiviral drug can mean the difference between having a milder illness and having a very serious illness that could result in a hospital stay.
- Most people who are otherwise healthy and get the flu do not need to be treated with antiviral drugs, but some people may be treated with antiviral drugs by their doctor.
- If you get the flu, the earlier you begin taking antivirals, the better.
- Antiviral drugs can make flu illness milder and shorten the time you are sick.
- There also are data showing that antiviral drugs may prevent serious flu complications such preventing pneumonia and hospitalizations in outpatients, and reducing mortality and length of stay in hospitalized patients.
- For example, in 2015, a CDC study found that early treatment of flu-hospitalized people 65 and older with flu antiviral medications cut the duration of their hospital stay and reduced their risk of needing extended care after discharge.
  - This study entitled “Impact of Prompt Influenza Antiviral Treatment on Extended Care Needs After Influenza Hospitalization Among Community-Dwelling Older Adults” by Sandra Chaves et al. is available from the Clinical

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Infectious Diseases journal website at

<http://cid.oxfordjournals.org/content/early/2015/09/01/cid.civ733>.

- See Influenza Antiviral Medications: Summary for Clinicians on the CDC web site for additional information.

### Laboratory Data

- CDC characterizes influenza viruses through one or more tests, including genomic sequencing, hemagglutination inhibition (HI) and/or neutralization assays.
- These data are used to compare how similar currently circulating influenza viruses are to recommended vaccine reference viruses.
- These data can give a general indication of how well flu vaccines might work.
- Antigenic similarity is evaluated by comparing cell-propagated circulating viruses with cell-propagated reference viruses.
- Laboratory data on viruses collected in the United States since October 1, 2017, indicate that most (99.2%) of circulating H3N2 influenza viruses remain similar to the cell-grown reference viruses that represent vaccine viruses recommended for use in the production of 2017-2018 U.S. influenza vaccines.
- **No significant antigenic drift has occurred among circulating wild-type influenza viruses at this time.**
  1. Even among H3N2 viruses, while there is considerable genetic diversity, no significant antigenic drift has been observed.
- However, a smaller percentage (70%) of circulating H3N2 viruses collected and tested since Oct 1, 2017, are similar to the egg-grown reference virus representing the virus recommended for use in egg-based Northern Hemisphere vaccines.
- These **differences are likely a result of egg-adapted changes** introduced when the H3N2 virus was grown in eggs.
- Compared with influenza A(H1N1) and B viruses, egg-adapted changes in H3N2 viruses are more complex and likely to have antigenic implications that can make these H3N2 viruses less similar to circulating H3N2 viruses.

### Vaccine Effectiveness

- The absence of antigenic drift suggests that vaccination with Northern Hemisphere influenza vaccines should offer protection similar to what has been seen during other seasons when cell culture propagated reference vaccine viruses and most circulating viruses were similar.
- While vaccine effectiveness can vary, a study that pooled influenza vaccine effectiveness estimates from 2007 to 2015 by virus type and subtype found that:
  - Multi-year pooled vaccine effectiveness against influenza B viruses was 54%;

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- Multi-year pooled vaccine effectiveness against influenza A(H1N1)pdm09 viruses was 61%;
- Multi-year pooled vaccine effectiveness against H3N2 viruses was 33%.
  - Belongia EA, Simpson, MD, King JF, Sundaran ME, Kelley NS, Osterholm MT, McLean HQ. [Variable influenza vaccine effectiveness by subtype: a systematic review and meta-analysis of test-negative design studies](#). Lancet Infect Dis. 2016; 16(8):942-51.
- It is important to note that during seasons when the majority of circulating viruses are very different from a vaccine virus, vaccine effectiveness can be further reduced.
- Two types of genetic changes can impact the similarity between a vaccine virus and circulating seasonal viruses.
  1. Influenza viruses constantly undergo small genetic changes. These genetic changes can sometimes result in antigenic changes. This is called **"antigenic drift."** (Circulating viruses "drift" away from what is included in the vaccine.)
    - For more information on antigenic changes, see CDC's Antigenic Characterization page at <https://www.cdc.gov/flu/professionals/laboratory/antigenic.htm>.
  2. Another type of change that can happen is that genetic changes occur when influenza viruses are grown in eggs, which is required for most U.S. flu vaccines.
    - These genetic changes (called **"egg-adapted"** changes) may have antigenic (or immunogenic) implications that may impact how well the vaccine works.
    - Egg-adapted changes that are associated with antigenic changes occur more often in H3N2 viruses.
- The lower vaccine effectiveness seen against H3N2 viruses during seasons when no antigenic drift has occurred may, in part, be caused by egg-adapted changes.
- Most U.S. flu vaccines are produced using egg-based technology.
- There are two flu vaccines in the United States that are not grown in eggs: recombinant influenza vaccine ([Flublok](#)) and cell-grown influenza vaccine ([Flucelvax](#)).
  - Recombinant vaccine is made by growing a certain protein from a naturally occurring ("wild type") recommended vaccine virus in insect cells.
  - This season, Flucelvax is being made using a cell-grown H3N2 candidate vaccine virus for the first time.

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- Previously Flucelvax had been produced using cell-based technology but with candidate vaccine viruses isolated in eggs per FDA regulatory requirements.
- On August 31, 2016, FDA approved the use of cell-isolated candidate vaccine viruses in the production of Flucelvax, the only licensed cell-based flu vaccine in the United States.
- For recombinant and cell-grown vaccines, the H3N2 components are genetically more similar to circulating H3N2 viruses than the egg-adapted viruses recommended for egg-based manufacturing.
- At this time there is insufficient data to determine whether cell-based or recombinant vaccine are more effective than egg-based vaccine.
- Additional data is needed (including vaccine effectiveness data) before policy decisions on this topic could be considered.

## **Influenza Vaccine Effectiveness in Australia during 2017 Season**

- The 2017 Southern Hemisphere influenza vaccine contained the same vaccine components as the Northern Hemisphere 2017-18 formulation.
- U.S. flu vaccine during 2016-17 also contained the same H3N2 component as was used in Australia during their 2017 season (A/Hong Kong).
- Data from influenza surveillance systems in Australia from May and September 2017 were used to estimate vaccine effectiveness (VE) of the 2017 Southern Hemisphere influenza vaccine at preventing medically attended illness in that country.
  - Overall, Australia estimated influenza vaccine effectiveness was 33% (with a 95% confidence interval [CI] of 17% to 46%) against all influenza viruses last season.
  - Australia estimated that VE against influenza A(H3N2) viruses was 10% (with a CI -16% to 31%) while VE against influenza B viruses was estimated to be 57% (CI 41% to 69%).
- In the United States last season (2016-2017), overall vaccine effectiveness of 39% (CI 32% to 46%) was measured.
  - VE against influenza A(H3N2) viruses was 32% (CI 23% to 41%).
  - VE against influenza B viruses of 52% (CI 43% to 61%) was seen during 2016-17 in the United States.
- The VE measured in Australia may not be predictive of what will happen in the United States in the 2017-18 season.
- Differences between VE estimates from the United States compared with Australia may have been due to differences in studies to measure VE, such as smaller sample size.

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- Looking at VE against H3N2 in the United States last season is likely a more appropriate comparison/predictor of what may happen here in the United States.
- VE in the 30 percent range also is what has been observed previously against H3N2 viruses.
- A study in Lancet Infectious Diseases that looked at a number of VE estimates from 2004-2015 found pooled VE of 33% (CI = 26%–39%) against H3N2 viruses, compared with 61% (CI = 57%–65%) against H1N1 and 54% (CI = 46%–61%) against influenza B viruses.  
([http://www.thelancet.com/pdfs/journals/laninf/PIIS1473-3099\(16\)00129-8.pdf](http://www.thelancet.com/pdfs/journals/laninf/PIIS1473-3099(16)00129-8.pdf))
- A QA on this topic has been posted on the CDC website at  
<https://www.cdc.gov/flu/about/season/flu-season-2017-2018.htm#effectiveness>.
  1. While flu vaccine is not perfect, and some people who get vaccinated may still get flu, there is some data to suggest that flu vaccination may make illness milder.
  2. Now is a good time to get vaccinated.

Go to <https://vaccinefinder.org> or [www.cdc.gov/flu](http://www.cdc.gov/flu) to find a location near you where you can get vaccinated.

### **FluView Activity Update (Key Flu Indicators)**

Influenza activity increased sharply again in this week's FluView report. The number of jurisdictions experiencing high activity went from 21 states to 26 states and New York City and the number of states reporting widespread activity went from 36 to 46. Influenza-like illness (ILI) went from 4.9% to 5.8%. These indicators are similar to what was seen at the peak of the 2014-2015 season, which was the most severe season in recent years. CDC continues to recommend influenza vaccination as flu viruses are likely to continue circulating for weeks. In addition, in the context of widespread influenza activity, CDC is reminding clinicians and the public about the importance of antiviral medications for treatment of influenza in people who are severely ill and people who are at high risk of serious flu complications.

### **Below is a summary of the key flu indicators for the week ending December 30, 2017 (week 52):**

- **Influenza-like Illness Surveillance:** For the week ending December 30, the proportion of people seeing their [health care provider](#) for influenza-like illness (ILI) was 5.8%, which is above the national baseline of 2.2%. All 10 regions reported a proportion of outpatient visits for ILI at or above their region-specific baseline levels. ILI has been at or above the national baseline for six weeks so far this season. During recent seasons, ILI has remained at or above baseline for 13 weeks on average.



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- Additional ILINet data, including national, regional, and select state-level data for the current and previous seasons, can be found at <http://gis.cdc.gov/grasp/fluview/fluportaldashboard.html>.
- **Influenza-like Illness State Activity Indicator Map:** New York City and 26 states experienced high ILI activity (Alabama, Arizona, Arkansas, California, Georgia, Illinois, Indiana, Kansas, Kentucky, Louisiana, Maryland, Michigan, Mississippi, Missouri, Nebraska, Nevada, New Jersey, New Mexico, Ohio, Oklahoma, Oregon, South Carolina, Texas, Virginia, Washington, and West Virginia). Puerto Rico and nine states (Alaska, Colorado, Hawaii, Iowa, Massachusetts, North Carolina, Pennsylvania, Tennessee, and Wyoming) experienced moderate ILI activity. The District of Columbia and six states (Florida, Minnesota, New York, South Dakota, Utah, and Wisconsin) experienced low ILI activity. Nine states experienced minimal ILI activity (Connecticut, Delaware, Idaho, Maine, Montana, New Hampshire, North Dakota, Rhode Island, and Vermont).
  - Additional data, including data for previous seasons, can be found at <https://gis.cdc.gov/grasp/fluview/main.html>
- **Geographic Spread of Influenza Viruses:** Widespread influenza activity was reported by 46 states (Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming). Regional influenza activity was reported by 4 states (Hawaii, Maine, New Hampshire, and New Jersey). Local influenza activity was reported by the District of Columbia. Guam, Puerto Rico and the U.S. Virgin Islands did not report. Geographic spread data show how many areas within a state or territory are seeing flu activity.
  - Additional data are available at: <https://gis.cdc.gov/grasp/fluview/FluView8.html>.
- **Flu-Associated Hospitalizations:** Since October 1, 2017, 3,927 laboratory-confirmed influenza-associated hospitalizations have been reported through the Influenza Hospitalization Network (FluSurv-NET), a population-based surveillance network for laboratory-confirmed influenza-associated hospitalizations. This translates to a cumulative overall rate of 13.7 hospitalizations per 100,000 people in the United States.
  - The highest hospitalization rates are among people 65 years and older (56.6 per 100,000), followed by adults aged 50-64 years (15.4 per 100,000), and

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children younger than 5 years (9.9 per 100,000). During most seasons, children younger than 5 years and adults 65 years and older have the highest hospitalization rates.

- During 2014-2015, crude unadjusted hospitalization rates reported during week 52 for all ages were 12.6 per 100,000. During that same week, hospitalization rates for people 65 years and older were 51.8 per 100,000. Hospitalization rates for children younger than 5 years were 16.5 per 100,000.
- Additional data, including hospitalization rates during other influenza seasons, can be found at <http://gis.cdc.gov/GRASP/Fluview/FluHospRates.html> and <http://gis.cdc.gov/grasp/fluview/FluHospChars.html>.

#### **▪ Mortality Surveillance:**

- The [proportion of deaths](#) attributed to pneumonia and influenza (P&I) was 6.7% for the week ending December 16, 2017 (week 50). This percentage is below the epidemic threshold of 6.9% for week 50 in the National Center for Health Statistics (NCHS) Mortality Surveillance System.
- Region and state-specific data are available at <https://gis.cdc.gov/grasp/fluview/mortality.html>.

#### **▪ Laboratory Data:**

- Nationally, the percentage of [respiratory specimens](#) testing positive for influenza viruses in clinical laboratories during the week ending December 30 was 25.5%.
- Regionally, the three week average percent of specimens testing positive for influenza in clinical laboratories ranged from 10.2% to 30.7%.
- During the week ending December 30, of the 9,228 (25.5%) influenza-positive tests reported to CDC by clinical laboratories, 7,818 (84.7%) were influenza A viruses and 1,410 (15.3%) were influenza B viruses.
- The most frequently identified influenza virus subtype reported by public health laboratories was influenza A(H3N2) virus.
- During the week ending December 30, 784 (84.9%) of the 923 influenza-positive tests reported to CDC by public health laboratories were influenza A viruses and 139 (15.1%) were influenza B viruses. Of the 742 influenza A viruses that were subtyped, 682 (91.9%) were H3N2 viruses and 60 (8.1%) were (H1N1)pdm09 viruses.
- The majority of the influenza viruses collected from the United States during October 1 through December 30, 2017 were characterized antigenically and genetically as being similar to the cell-grown reference viruses representing the 2017–18 Northern Hemisphere influenza vaccine viruses.

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- Since October 1, 2017, CDC has tested 111 influenza A(H1N1)pdm09, 462 influenza A(H3N2), and 127 influenza B viruses for resistance to antiviral medications (i.e. oseltamivir, zanamivir, or peramivir). While the majority of the tested viruses showed susceptibility to the antiviral drugs, one H1N1pdm09 virus was resistant to both oseltamivir and peramivir, but was sensitive to zanamivir.

[FluView \(http://www.cdc.gov/flu/weekly/fluactivitysurv.htm\)](http://www.cdc.gov/flu/weekly/fluactivitysurv.htm) is available – and past issues are [archived \(http://www.cdc.gov/flu/weekly/pastreports.htm\)](http://www.cdc.gov/flu/weekly/pastreports.htm) – on the CDC website.

Note: Delays in reporting may mean that data changes over time. The most up to date data for all weeks during the 2017-2018 season can be found on the current [FluView\(http://www.cdc.gov/flu/weekly/\)](http://www.cdc.gov/flu/weekly/) and FluView Interactive (<https://www.cdc.gov/flu/weekly/fluviewinteractive.htm>).

#### **▪ Pediatric Deaths**

- One influenza-associated pediatric death was reported to CDC during week 52.
  - This death was associated with an influenza A virus for which no subtyping was performed and occurred during week 52 (the week ending December 30, 2017).
- A total of 13 influenza-associated pediatric deaths for the 2017-2018 season have been reported to CDC.
- Additional information on pediatric deaths is available on FluView Interactive at: <https://gis.cdc.gov/GRASP/Fluview/PedFluDeath.html>.

## **Influenza Forecasting Initiative**

- CDC's Influenza Division began working in 2013 to advance flu forecasting efforts by engaging with members of the scientific community to develop innovative methods to predict flu activity.
- CDC and forecasting groups are working together to improve the accuracy and usability of seasonal influenza forecasts.
- Each week during the influenza season, CDC's Influenza Division displays the forecasts received through the forecasting initiative on an interactive website (<https://predict.phiresearchlab.org>). This season CDC is displaying forecasts for flu-related illness at the national, regional, and state-level.

### **Below is the Influenza Forecasting Update for Week 51**

- The FluSight Ensemble forecast for the United States (an average of 29 individual forecasts) indicates there is a 75% chance that the peak of influenza-like illness activity will occur before the end of January. This means that relative to the historical average, the week during which influenza activity peaks nationally, may be earlier.

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- In terms of the amount of flu-related illness, the FluSight Ensemble forecast for the amount of ILI (expressed as a percentage) that will occur at the peak of flu activity indicates there's a greater chance (30%) that the United States will have a high-severity season than the historical average, but there's wide variation in individual intensity forecasts. ILINet values above 6.7% may indicate severe seasons.
- Full forecasts, including those for individual states, are available at <https://predict.phiresearchlab.org>